國立成功大學

111學年度碩士班招生考試試題

編　號：196

系　所：製造資訊與系統研究所

科　目：計算機概論

日　期：0219

節　次：第 2 節

備　註：不可使用計算機

編號： 196

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※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Briefly describe the following terms.

(a) Embedded System. (10%)

(b) Genetic Algorithm. (10%)

2. You are asked to develop a manufacturing application on a four-core Rasperry Pi (RPi) device for collecting data from an equipment with data generation rate λ. The collected data will be sent to a REST API in a remote server through Internet. Assume a core of the RPi can collect λ data records per second. For keeping the RPi system stable, your manufacturing application does not place the collected data in the RPi's storage (i.e., sending back the collected data in the real-time manner). Please write Python-like pseudo codes to collect/send data with parallel processing capacity. Also describe limitations of your algorithm if necessary. (20%)

3. (a) Draw an ER diagram according to the following requirements. (10%)
A friend asks you to help her design a database to model doctors' offices across Tainan. She described requirements as follows. You need to finish the ER diagram and define a number of constraints to ensure that you model the semantics of an office as closely as possible.

Make sure that you do not impose additional constraints not defined by the model.

- A doctor has a name, mobile phone number (possibly multiple phone#), and a unique badgeId for been identified. A doctor may manage more than one office.
- An office is identified by its officeID and has address and phone numbers (possibly more than one phone #). An office contains one or more exam rooms and may be managed by at most one doctor.
- An exam room can be identified by its room number, and the office that it is in.
- A patient has SSN, name, and phone number. Each patient is uniquely identified by their SSN.
- When a patient visits an office, he or she has a consultation with a doctor in an examination room. The start time and the end time need to be recorded for a consultation.

(b) Transform the ER diagram of the above doctors' office system into the relational schema. (10%)

4. You work on a financial-technology (FinTech) project and are assigned to write a linear regression model to predict stock trends. Assume the linear regression model is in the form: $y = C \cdot t^2 + D \cdot t + E$. Given stock price samples (y) in five time units (t) as follows:

t	0	1	2	3	4
y	600	580	570	610	620

(a) Write Python-like pseudo codes to find the best-fitting coefficients for the linear regression model. (10%)

(b) Analyze the computation complexity of your answer in (a). (10%)

(c) At $t = 5$, the stock price is 666. Write Python-like pseudo codes to calculate the residue that your model makes. (10%)

5. Consider the database relation with schema: **Book**(Bnumber, Title, Publisher, Price, PublishedYear). Write a SQL statement to retrieve the first five publishers with most amount of books and the number of books published by them, where books published after 2016 are considered and publishers whose the average book price is less than 550 dollars are discarded. (10%)